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Please find below and/or attached an Office communication concerning this application or proceeding.

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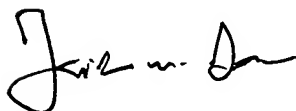
Response to Request

1. In response to applicant's request: copy of Provisional application (No. 60/205,811) was filed on May 19, 2000.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kiet Doan whose telephone number is 703-305-4749. The examiner can normally be reached on 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Trost can be reached on 703-308-5318. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Patent Examiner



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BOX PROVISIONAL PATENT APPLICATION
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Docket No.: 0208.0015P

Sir:

Transmitted herewith for filing is a **PROVISIONAL** patent application of:

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For: FIREARM LASER TRAINING SYSTEM AND METHOD EMPLOYING AN
ACTUABLE TARGET ASSEMBLY

Enclosed are:

19 Pages of the Specification;

10 Pages Appendix A; and

9 Sheets of Drawings

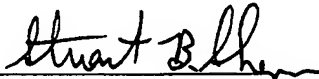
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Enclosed is check #3803 in the amount of \$150.00 for payment of the filing fee under 37 C.F.R. §1.16(k).

The Commissioner is hereby authorized to charge payment of any additional fees required for the above-identified application or credit any overpayment to Deposit Account No. 05-0460.

All correspondence regarding this application should be directed to EPSTEIN, EDELL & RETZER at the above address.

Respectfully submitted,


Stuart B. Shapiro
Registration No. 40,169

Via Express-Mail Delivery: May 19, 2000

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PROVISIONAL PATENT APPLICATION

Title: Firearm Laser Training System and Method Employing an Actuable Target Assembly

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1 Fig. 1 is a view in perspective of a firearm laser training system having a laser beam directed
2 from a firearm onto an actuable target assembly according to the present invention.

3 Fig. 2 is an exploded view in perspective and partial section of a laser transmitter assembly
4 of the system of Fig. 1 fastened to a firearm barrel.

5 Fig. 3 is a schematic block diagram of the firearm laser training system of Fig. 1.

6 Fig. 4 is a view in perspective of an actuable target assembly of the system of Fig. 1
7 according to the present invention.

8 Figs. 5 - 7 are schematic illustrations of exemplary graphical user screens displayed by the
9 system of Fig. 1 for training activities.

10 Fig. 8 is an exemplary report generated by the system of Fig. 1.

11 Fig. 9 is a schematic illustration of an exemplary graphical user screen displayed by the
12 system of Fig. 1 for a competition event.

13 14 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 A firearm laser training system employing an actuable target assembly according to the
16 present invention is illustrated in Fig. 1. Specifically, the firearm laser training system includes a
17 laser transmitter assembly 2, actuable target assemblies 10 each having a target 12, a distribution unit
18 14, a control unit 16 and a computer system 18. The laser assembly is attached to an unloaded user
19 firearm 6 to adapt the firearm for compatibility with the training system. By way of example only,
20 firearm 6 is implemented by a conventional hand-gun and includes a trigger 7, a barrel 8, a hammer
21 9 and a grip 15. However, the firearm may be implemented by any conventional firearms (e.g., hand-
22 gun, rifle, shotgun, etc), while the laser and firearm combination may be implemented by any of the

1 simulated firearms disclosed in the above-mentioned patent applications. Laser assembly 2 includes
2 a laser transmitter rod 3 and a laser transmitter module 4 that emits a beam 11 of visible laser light
3 in response to actuation of trigger 7. Rod 3 is connected to module 4 and is configured for insertion
4 within barrel 8 to fasten the laser assembly to the barrel as described below. A user aims unloaded
5 firearm 6 at a particular target 12 and actuates trigger 7 to project laser beam 11 from laser module
6 4 toward that target. The target assemblies raise and lower targets 12 in accordance with control
7 signals from computer system 18 as described below. The targets are individually raised by
8 corresponding target assemblies 10 at prescribed times for a specific time interval to indicate
9 intended targets for the user, and are lowered in response to the beam impacting the raised targets
10 within that interval (e.g., indicating a hit) or upon expiration of the interval without a beam impact
11 (e.g., indicating a miss).

12 The system may be utilized to simulate training systems employed by the military or law
13 enforcement, such as the Remote Electronic Target System (RETS). This type of system is typically
14 employed on a firing range and provides various targets that become raised (e.g., pop-up) for the
15 trainee. The laser training system may simulate the view or conditions the trainee encounters in the
16 RETS system, thereby providing angular perception training and angular queuing training (e.g.,
17 training to shoot the highest priority threat or closest target). The laser system typically employs
18 seven targets to simulate the RETS system, but may include any quantity of targets. The targets
19 become raised and/or lowered during the training exercise as described below. In addition, the
20 system may be utilized to simulate firearm competitions, such as the International Practical Shooting
21 Competition (IPSC). The object of this competition is to hit each of successive targets in the shortest
22 time interval. The laser system may simulate this competition and measure the time interval for

1 impacting a series of assembly targets.

2 Target 12 is used in conjunction with signal processing circuitry adapted to detect the
3 modulated or coded laser beam. The target, by way of example, includes a visible circular bull's eye
4 40 with quadrant dividing lines 42, and detectors disposed across the target surface to detect the
5 beam. A corresponding assembly control unit analyzes detection signals from the detectors to lower
6 the associated raised target in response to beam impact and forwards information to computer system
7 18 to provide feedback information to the user via a display (Figs. 6 - 7 and 9) and/or printer 20
8 (Figs. 3 and 8). The target is scaled to simulate shooting conditions at further distances, such as
9 those within firing ranges, and is similar to the electronic targets disclosed in the above-mentioned
10 patent applications. In addition, the target may utilize masks to display various targets or provide
11 shooting drills (e.g., illustrations of animals with intended target sites, target sites at specific
12 locations or having particular sizes, etc.), such as those disclosed in the aforementioned patent
13 applications. The system may utilize "dry fire" type firearms or firearms utilizing modified blank
14 cartridges (e.g., such as those disclosed in the above-mentioned patent applications) for projecting
15 a laser beam to provide full realism in a safe environment.

16 An exemplary laser transmitter assembly employed by the training system is illustrated in
17 Fig. 2. Specifically, laser assembly 2 includes laser transmitter rod 3 and laser transmitter module
18 4. Rod 3 includes a generally cylindrical barrel member 17 and a stop 19 disposed at the barrel
19 member distal end. The barrel member is elongated with a tapered proximal end and has transverse
20 cross-sectional dimensions that are slightly less than the cross-sectional dimensions of barrel 8 to
21 enable the barrel member to be inserted within the barrel. However, the barrel member may be of
22 any shape or size to accommodate firearms of various calibers. Adjustable rings 72, 74 are disposed

about the barrel member toward its proximal and distal ends, respectively. The dimensions of each ring are adjustable to enable barrel member 17 to snugly fit within and frictionally engage barrel 8 in a secure manner. Stop 19 is in the form of a substantially circular disk having a diameter slightly greater than the cross-sectional dimensions of barrel 8 to permit insertion of rod sections proximal of the stop into the barrel. The stop may alternatively be of any shape or size capable of limiting insertion of the rod into the barrel. Barrel member 17 is connected to the approximate center of stop 19, while a post 21 is attached to and extends distally for a slight distance from an approximate center of a stop distal surface. Post 21 is substantially cylindrical and has transverse cross-sectional dimensions similar to those of barrel member 17, but may be of any shape or size. The post includes external threads 23 for facilitating engagement with laser module 4 as described below.

Laser module 4 includes a housing 25 having an internally threaded opening 60 defined in an upper portion of a housing rear wall for receiving post 21 and attaching the laser module to rod 3. The housing and opening may be of any shape or size, while the opening may be defined in the housing at any suitable locations. The laser module components are disposed within the housing and include a power source 27, typically in the form of batteries, a mechanical wave sensor 29 and an optics package 31 having a laser (not shown) and a lens 33. These components may be arranged within the housing in any suitable fashion. The optics package emits laser beam 11 through lens 33 toward target 12 or other intended target in response to detection of trigger actuation by mechanical wave sensor 29. Specifically, when trigger 7 is actuated, hammer 9 impacts the firearm and generates a mechanical wave which travels distally along barrel 8 toward rod 3. As used herein, the term "mechanical wave" or "shock wave" refers to an impulse traveling through the firearm barrel. Mechanical wave sensor 29 within the laser module senses the mechanical wave from the hammer

1 impact and generates a trigger signal. The mechanical wave sensor may include a piezoelectric
2 element, an accelerometer or a solid state sensor, such as a strain gauge. Optics package 31 within
3 the laser module generates and projects laser beam 11 from firearm 6 in response to the trigger
4 signal. The optics package laser is generally enabled for a predetermined time interval sufficient for
5 the target to detect the beam. The beam may be coded, modulated or pulsed in any desired fashion.
6 Alternatively, the laser module may include an acoustic sensor to sense actuation of the trigger and
7 enable the optics package. The laser module is similar in function to the laser devices disclosed in
8 the aforementioned patent applications. The laser assembly may be constructed of any suitable
9 materials and may be fastened to firearm 6 at any suitable locations by any conventional or other
10 fastening techniques.

11 Referring to Fig. 3, computer system 18 controls system operation and may provide various
12 feedback to a user. The computer system is typically implemented by a conventional IBM-
13 compatible laptop or other type of personal computer (e.g., notebook, desk top, mini-tower, Apple
14 MacIntosh, palm pilot, etc.) preferably equipped with display or monitor 34, a base 32 (i.e., including
15 the processor, memories, and internal or external communication devices or modems) and a
16 keyboard 36 (e.g., including a mouse or other input device). Computer system 18 includes software
17 to enable the computer system to communicate with and control target assemblies 10 and provide
18 feedback to the user. The computer system may utilize any of the major platforms (e.g., Linux,
19 Macintosh, Unix, OS2, etc.), but preferably includes a Windows environment (e.g., Windows 95,
20 98, NT, or 2000). Further, the computer system includes components (e.g. processor, disk storage
21 or hard drive, etc.) having sufficient processing and storage capabilities to effectively execute the
22 system software. By way of example only, computer system 18 includes a pentium or compatible

processor and at least sixteen megabytes of RAM.

Computer system 18 is connected to control unit 16, while target assemblies 10 are connected to distribution unit 14. Control unit 16 is typically connected to the computer system parallel port and transmits control signals received from the computer system to target assemblies 10 via the distribution unit as described below. The connections between the control unit, distribution unit, computer system and target assemblies are preferably implemented by suitable cables. A printer 20 may further be connected to control unit 16 to print reports containing user feedback information (e.g., score, hit/miss information, etc.). The computer system basically transmits the report information through the control unit to the printer via a control unit selector switch (not shown). The switch is manipulable by the user and selectively directs information from the control unit to either the printer or distribution unit. The switch essentially serves as a power or on/off switch where power is enabled when information is directed to the distribution unit.

The control unit includes a conventional or commercially available microprocessor board, such as a K8000, and relays control signals from the computer system to control the target assemblies. Specifically, the computer system generates controls for the target assemblies in accordance with an entered target sequence. The control information typically includes a command to raise a specific target and the duration to maintain the raised state for a beam impact. The computer system may control each target assembly individually. The control signals are encoded by the computer system and transmitted to the control unit through the computer system parallel port. The control unit receives the encoded signals and decodes them to determine the controls for the individual target assemblies. The control unit checks the current status of the target assemblies (e.g., may request information from an assembly), and in response to proper status, transmits the control

1 signals to distribution unit 14. The distribution unit receives the control signals and forwards them
2 to the control units of the appropriate target assemblies. Thus, the control unit basically decodes
3 control signals and disseminates them through the various bits of a transmitted signal.

4 When a target is raised in response to the control signal, hit or miss information associated
5 with that target is transmitted from the corresponding target assembly to the distribution unit. The
6 distribution unit forwards the information to the control unit. This information, by way of example,
7 may be in the form of the target status (e.g., raised or lowered). The control unit encodes the
8 information and transmits it to the computer system for processing. A target lowered within the
9 prescribed interval indicates a hit, and the computer system processes the information for display and
10 reports as described below. A hit target is lowered by the target assembly control unit as described
11 below. The hit or miss information may include any type of information to indicate beam impact
12 on a target.

13 The control unit typically accommodates a maximum of seven target assemblies, however,
14 the control unit may be connected to additional control units (e.g., up to three or more units) in a
15 master/slave arrangement to accommodate an increased quantity of target assemblies. The master
16 unit basically receives control signals from the computer system and transmits the signals to the
17 appropriate slave units accommodating the target assemblies specified in the control signals. The
18 slave control units are substantially similar to the master unit, but may include fewer components
19 (e.g., be constructed without the parallel port, printer port or power supply), thereby reducing costs.

20 A target assembly 10 according to the present invention is illustrated in Fig. 4. Specifically,
21 the target assembly includes a frame 50, an assembly control unit 52, a motor 54, a power source or
22 battery 56 and a movable arm 58 having target 12 attached thereto. Frame 50 includes a base 62 and

1 a side wall 64, each having a generally rectangular configuration. The side wall is substantially
2 perpendicular to the base having its bottom edge joined to a base side edge. A handle 66 is attached
3 to and transversely extends from an upper edge of the side wall interior surface, while legs 68 are
4 attached to and extend from the front and rear lower sections of the side wall to provide stability for
5 the target assembly. The legs each include an elongated bar 70 having a foot 76 disposed at the bar
6 distal end. The base includes assembly control unit 52, motor 54 and power source 56 mounted
7 thereon. Arm 58 is disposed adjacent the side wall exterior surface and is attached to a shaft (not
8 shown) that extends through the side wall and is coupled to motor 54. The arm has an inverted 'L'
9 configuration with the target attached to the arm section extending substantially parallel to the base.
10 The motor rotates the shaft, thereby actuating arm 58 to raise or lower target 12 in response to
11 control signals from assembly control unit 52. A series of switches (not shown) are disposed toward
12 the upper edge of the side wall exterior surface to control arm actuation, while a plurality of stops
13 78 are disposed in the path of arm movement, via a corresponding bracket 80 mounted to the side
14 wall exterior surface, to limit motion of the arm and target. A pair of cams (not shown) are disposed
15 on the shaft adjacent side wall 64, and are configured to toggle the switches during arm movement.
16 The switches provide signals to assembly control unit 52 to indicate the location of the arm within
17 its motion path, thereby enabling the assembly control unit to control motor 54 accordingly.

18 Assembly control unit 52 is connected to distribution unit 14, motor 54, power source 56,
19 target 12 and the switches via suitable cables, and controls target assembly operation in accordance
20 with control signals from computer system 18. The assembly control unit includes a commercially
21 available processor and receives control signals from the distribution unit. The assembly control unit
22 interprets the control signals and controls the arm to raise the target for the specified time interval,

1 or until the raised target is impacted by the beam. Further, the assembly control unit controls target
2 actuation based on the arm position indicated by the switch signals as described above. When a time
3 interval for a raised target expires, the assembly control unit controls motor 54 to lower the target
4 and transmits a miss indication to distribution unit 14 for forwarding to computer system 18. In
5 response to the laser beam impacting target 12, the target sends a signal to the control unit indicating
6 beam impact. The control unit subsequently determines whether or not the impact occurred within
7 the specified time interval, and if so, controls motor 54 to lower the target. The assembly control
8 unit further transmits a hit indication to distribution unit 14 for forwarding to computer system 18.
9 The hit or miss information may include the raised or lowered status of the target to enable the
10 computer system to determine the presence of a hit as described above. The time intervals and target
11 sequence are programmable via computer system 18 to stimulate various scenarios as described
12 below. The assembly control unit may further respond to status inquiries of the target assembly by
13 control unit 16.

14 In addition, assembly control unit 52 includes a series of indicators, preferably in the form
15 of light emitting diodes (LED), to indicate the status of the target. By way of example only, the
16 assembly control unit housing includes three indicators arranged in vertical relation. An uppermost
17 indicator (e.g., red) indicates target 12 in a raised position, while a central indicator (e.g., green)
18 indicates the beam impacting target 12. This indicator remains illuminated until a successive raising
19 and lowering of the target. A lowermost indicator indicates target 12 in a lowered position. A target
20 power switch controls power to assembly control unit 52.

21 Computer system 18 includes software to control system operation and provide a graphical
22 user interface for displaying user performance and entering information. In particular, user

1 information and a particular target sequence is entered into the computer system to control target
2 assemblies 10 (Fig. 5). The sequence typically includes the order in which targets 12 are to be raised
3 and the duration for maintaining the targets in a raised state to permit beam impact. Each target may
4 be individually controlled and selectively specified in the sequence. The computer system executes
5 the sequence by transmitting control signals to the target assembly control units via control and
6 distribution units 16, 14, at the appropriate times. The control signals typically include information
7 directing the assemblies to raise the target for the time interval specified in the sequence as described
8 above.

9 When a specified target is placed in the raised position, this indicates to the user an intended
10 target. The user subsequently aims firearm 6 at the raised target to project laser beam 11 at that
11 target. In response to beam impact, target 12 provides signals to corresponding control unit 52 to
12 indicate a hit. Control unit 52 provides impact signals (e.g., hit or miss information) to the computer
13 system, and lowers the target in response to a hit or expiration of the specified time interval as
14 described above. Computer system 18 receives the impact information from the target assemblies
15 and calculates a corresponding score. The score may be based on the time required to hit a target
16 and/or distances between the user and the target. Alternatively, the target information may include
17 location information of beam impact (e.g., x and y coordinates) to determine scores based on
18 proximity of the beam impact to an intended target site.

19 Once scores have been determined, computer system 18 may provide the scores on a
20 graphical user screen. Exemplary screens providing scoring and other information are illustrated in
21 Figs. 6 - 7. These screens typically provide the target sequence including the particular target, the
22 time interval of raised status (T), the lane of the target (L), and target status (S). In addition, these

1 screens generally provide a hit or miss indication along with ranges, scoring and other information.

2 A report containing similar information relating to performance of a user may be printed by printer
3 20 and is illustrated, by way of example only, in Fig. 8. It is to be understood that the screens and
4 report may be arranged in any fashion and include any types of information.

5 The system may be utilized to simulate a RETS range utilized in military or law enforcement
6 training as described above or to simulate a competition event, such as IPSC. Accordingly, the target
7 may be configured to present any type of graphic to simulate conventional targets for these or other
8 types of activities (e.g., E-type Silhouette, military pop-up targets, plates, etc.). An IPSC event
9 typically utilizes five targets (e.g., plates) that are successively raised. The object is to hit each target
10 in succession in the shortest time interval. In order to simulate this event, the system may utilize five
11 target assemblies, while computer system 18 may include a sequence to control the target assemblies
12 in a manner similar to the competition. The computer system functions as described above to control
13 the target assemblies, and measures the time interval for a user to hit each target. The results may
14 be displayed or printed by computer system 18 as described above. An exemplary display for a IPSC
15 competition is illustrated in Fig. 9, however, the display may be arranged in any fashion and include
16 any types of information.

17 Operation of the system is described with reference to Figs. 1 - 4. Initially, user information
18 and a target sequence is entered into computer system 18 via graphical user screens (e.g., Fig. 5).

19 The system may accommodate any sequence for any quantity of target assemblies (e.g., at least one).

20 Laser transmitter rod 3 is connected to laser module 4 and inserted into barrel 8 of firearm 6 as
21 described above. The laser module is actuated in response to depression of firearm trigger 7. Any
22 of the lasers or firearms disclosed in the above-mentioned patent applications may be utilized (e.g.,

1 systems employing dry fire or modified blank cartridges). The target assemblies are arranged in a
2 desired configuration and computer system 18 is commanded to control the target assemblies in
3 accordance with the entered sequence. As each target 12 is raised, the user aims the firearm and
4 projects a laser beam at that target. When a raised target is impacted within the specified time
5 interval, the target is lowered and hit information is transmitted to the computer system as described
6 above. In addition, a hit is indicated by the control unit indicator (LED) as described above. If the
7 beam does not impact a raised target within the specified time interval, the target is lowered and miss
8 information is transmitted to the computer system as described above. The computer system receives
9 the hit and miss information and provides feedback information to the user in the form of graphical
10 user screens (e.g., Figs. 6 - 7) and/or a printed report (e.g., Fig. 8) as described above.

11 Alternatively, the system may simulate a competition, such as IPSC, where the computer
12 system measures the time interval required to hit each of successive targets. The system operates
13 as described above, and further provides the measured time interval on a display (Fig. 9) or printed
14 report.

15 It will be appreciated that the embodiments described above and illustrated in the drawings
16 represent only a few of the many ways of implementing a firearm laser training system and method
17 employing an actuable target assembly.

18 The system may include any quantity of target assemblies arranged in any desired fashion.
19 The computer system may be implemented by any conventional or other computer or processing
20 system, and control the target assemblies to operate in any desired target sequence. The computer
21 system may be directly connected to the target assemblies via any communications mechanisms.
22 Further, the system components may be connected by any communications devices (e.g., cables,

1 wireless, network, etc.) in any desired fashion. The computer system may be in communication with
2 other training systems via any type of communications medium (e.g., direct line, telephone
3 line/modem, network, etc.) to facilitate group training or competitions. The system may be
4 configured to simulate any types of training or competition scenarios. The printer may be
5 implemented by any conventional or other type of printer. The system may raise any quantity of
6 targets simultaneously to provide multiple targets for a user.

7 The firearm laser training system may be utilized with any type of firearm (e.g., hand-gun,
8 rifle, shotgun, machine gun, etc.), while the laser module may be fastened to the firearm at any
9 suitable locations via any conventional or other fastening techniques (e.g., frictional engagement
10 with the barrel, brackets attaching the device to the firearm, etc.). Further, the system may include
11 a dummy firearm projecting a laser beam, or replaceable firearm components (e.g., a barrel) having
12 a laser device disposed therein for firearm training. The replaceable components (e.g., barrel) may
13 further enable the laser module to be operative with a firearm utilizing any type of blank cartridges.
14 The laser assembly may include the laser module and rod or any other fastening device. The laser
15 module may emit any type of laser beam within suitable safety tolerances. The laser module housing
16 may be of any shape or size, and may be constructed of any suitable materials. The opening may be
17 defined in the module housing at any suitable locations to receive the rod. Alternatively, the housing
18 and rod may include any conventional or other fastening devices (e.g., integrally formed, threaded
19 attachment, hook and fastener, frictional engagement with the opening, etc.) to attach the module
20 to the rod. The optics package may include any suitable lens for projecting the beam. The laser
21 beam may be enabled for any desired duration sufficient to enable the target to detect the beam. The
22 laser module may be fastened to a firearm or other similar structure (e.g., a dummy, toy or simulated

firearm) at any suitable locations (e.g., external or internal of a barrel) and be actuated by a trigger or any other device (e.g., power switch, firing pin, relay, etc.). Moreover, the laser module may be configured in the form of ammunition for insertion into a firearm firing or similar chamber and project a laser beam in response to trigger actuation. Alternatively, the laser module may be configured for direct insertion into the barrel without the need for the rod. The laser module may include any type of sensor or detector (e.g., acoustic sensor, piezoelectric element, accelerometer, solid state sensors, strain gauge, etc.) to detect mechanical or acoustical waves or other conditions signifying trigger actuation. The laser module components may be arranged within the housing in any fashion, while the module power source may be implemented by any type of batteries. Alternatively, the module may include an adapter for receiving power from a common wall outlet jack or other power source. The laser beam may be visible or invisible (e.g., infrared) and may be modulated in any fashion (e.g., at any desired frequency or unmodulated) or encoded to provide any desired information.

The laser transmitter rod may be of any shape or size, and may be constructed of any suitable materials. The rod may include dimensions to accommodate any firearm caliber. The rings may be of any shape, size or quantity and may be constructed of any suitable materials. The rings may be disposed at any locations along the rod and may be implemented by any devices having adjustable dimensions. The stop may be of any shape or size, may be disposed at any suitable locations along the rod and may be constructed of any suitable materials. The post may be of any shape or size, may be disposed at any suitable locations on the rod, and may be constructed of any suitable materials. The post or rod may include any conventional or other fastening devices to attach the laser module to the rod.

1 The target may be implemented by any of the electronic targets described in the
2 aforementioned patent applications, or any device that can detect laser beam impact. The target may
3 be configured to detect any energy medium having any modulation, pulse or frequency. Similarly,
4 the laser may be implemented by a transmitter emitting any suitable energy wave. The target may
5 be of any shape or size, include any laser detecting circuitry, and present any type of conventional
6 or other target configurations. The target may include any conventional or other fastening devices
7 to attach a mask to the target. The masks may be of any shape or size, may be disposed on the target
8 at any suitable locations and may be constructed of any suitable materials (e.g., may be transparent,
9 translucent, opaque or any combination or degrees thereof). The masks may include any
10 conventional or other fastening devices for attachment to the target. The masks may include any
11 illustration and/or configuration having openings or slots of any shape, size or quantity defined at
12 any suitable locations for training in any types of firearm activities. The masks and targets may be
13 scaled in any fashion to simulate any desired distances.

14 The target assembly structural components (e.g., frame, base, side wall, legs, arm, etc.) may
15 be of any shape or size, and may be constructed of any suitable materials. The motor may be
16 implemented by any suitable motor or driver. The target may be attached to the arm via any
17 conventional fastening techniques. The legs and stoppers may be attached to the frame via any
18 conventional fastening techniques at any suitable locations. The assembly components may be
19 arranged on the frame in any desired fashion. The handle may be implemented by any conventional
20 or other handle. The cams may be of any quantity, shape or size and may be disposed on the shaft
21 at any suitable locations. The arm may be attached to the shaft or directly to the motor. The power
22 source may be implemented by any type of conventional or other power source (e.g., battery, wall

outlet jack, etc.). The target may be placed in any desired position by the assembly. The assembly control unit may include any quantity of any type (e.g., LED) of indicators of any shape or size to indicate target status (e.g., raised, lowered, hit or miss, etc.). The target assembly may be configured to accommodate any quantity of targets. The assembly control unit may include any conventional or other processor or circuitry to control assembly operation. The switches may be implemented by any conventional or other switches.

The control unit may include any type of conventional or other microprocessor board or other processing circuitry to provide the above-described functions. The control signals and other information may be encoded by or for compatibility with the computer system in any desired fashion.

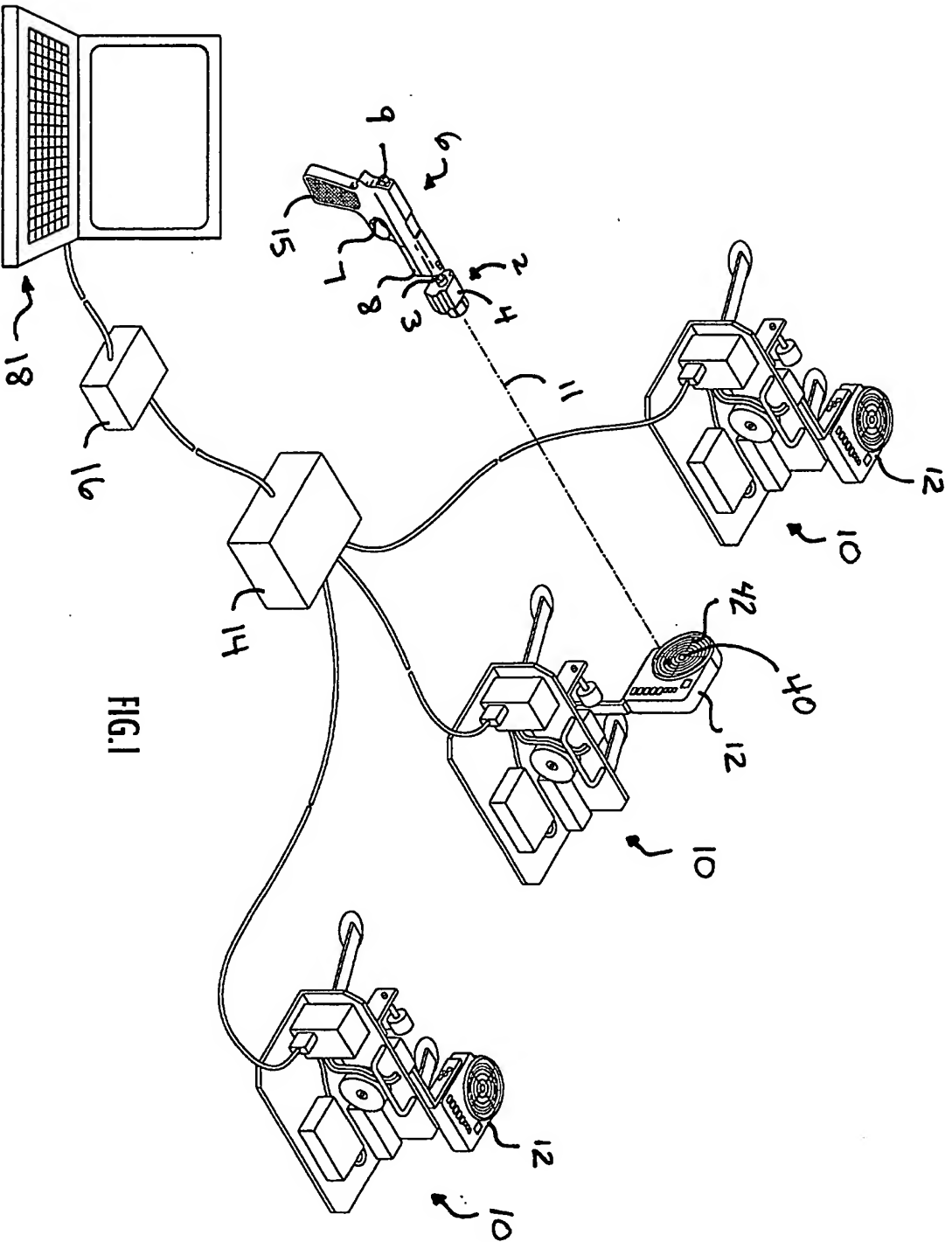
The computer system and other control signals may include any types of information or commands to control the target assemblies in any fashion. The control signals and other information may be formatted in any desired fashion for transmission between the computer system and target assemblies. The control unit may be connected to the computer system via any desired port, and may be directly connected to the target assemblies. The distribution unit may include any conventional or other connection devices or circuitry to distribute the control signals to the target assemblies. The distribution unit may be directly connected to the computer system.

It is to be understood that the software for the various processors and computer systems may be implemented in any desired computer language and could be developed by one of ordinary skill in the computer arts based on the functional descriptions contained herein. The processors and computer systems may alternatively be implemented by hardware or other processing circuitry. The display screens and reports may be arranged in any fashion and contain any type of information. The system may produce any desired type of display or report having any desired information. The

computer system may determine scores based on any desired criteria. The various functions of the processors and computer system may be distributed in any manner among any quantity of processing systems or circuitry.

The present invention is not limited to the applications disclosed herein, but may be utilized for any type of firearm training. Additional exemplary embodiments of the present invention are described in Appendix A appended hereto.

1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2792 2793 2794 2795 2796 2797 2798 2799 2800 2801 2802 2803 2804 2805 2806 2807 2



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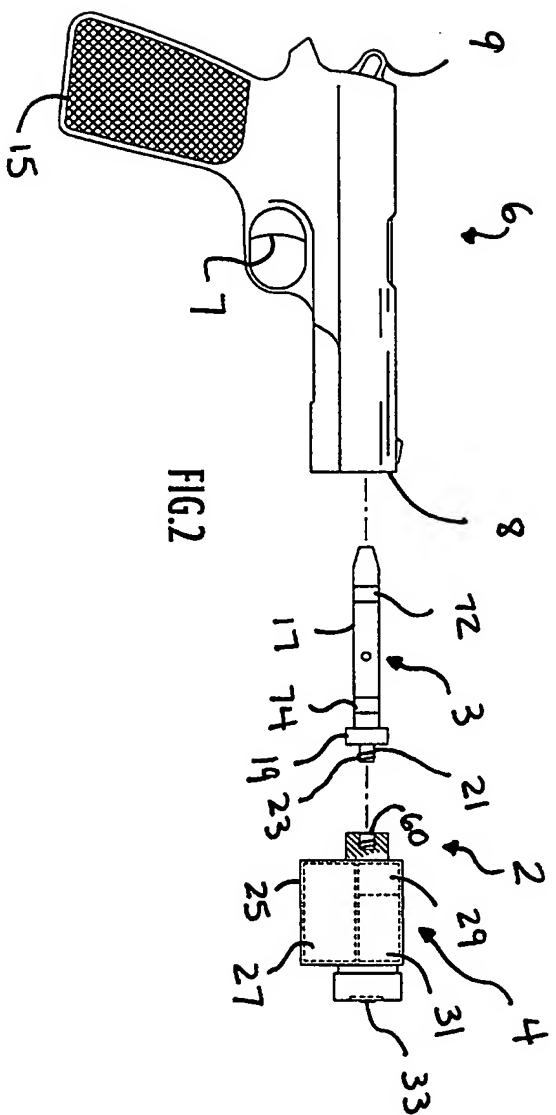
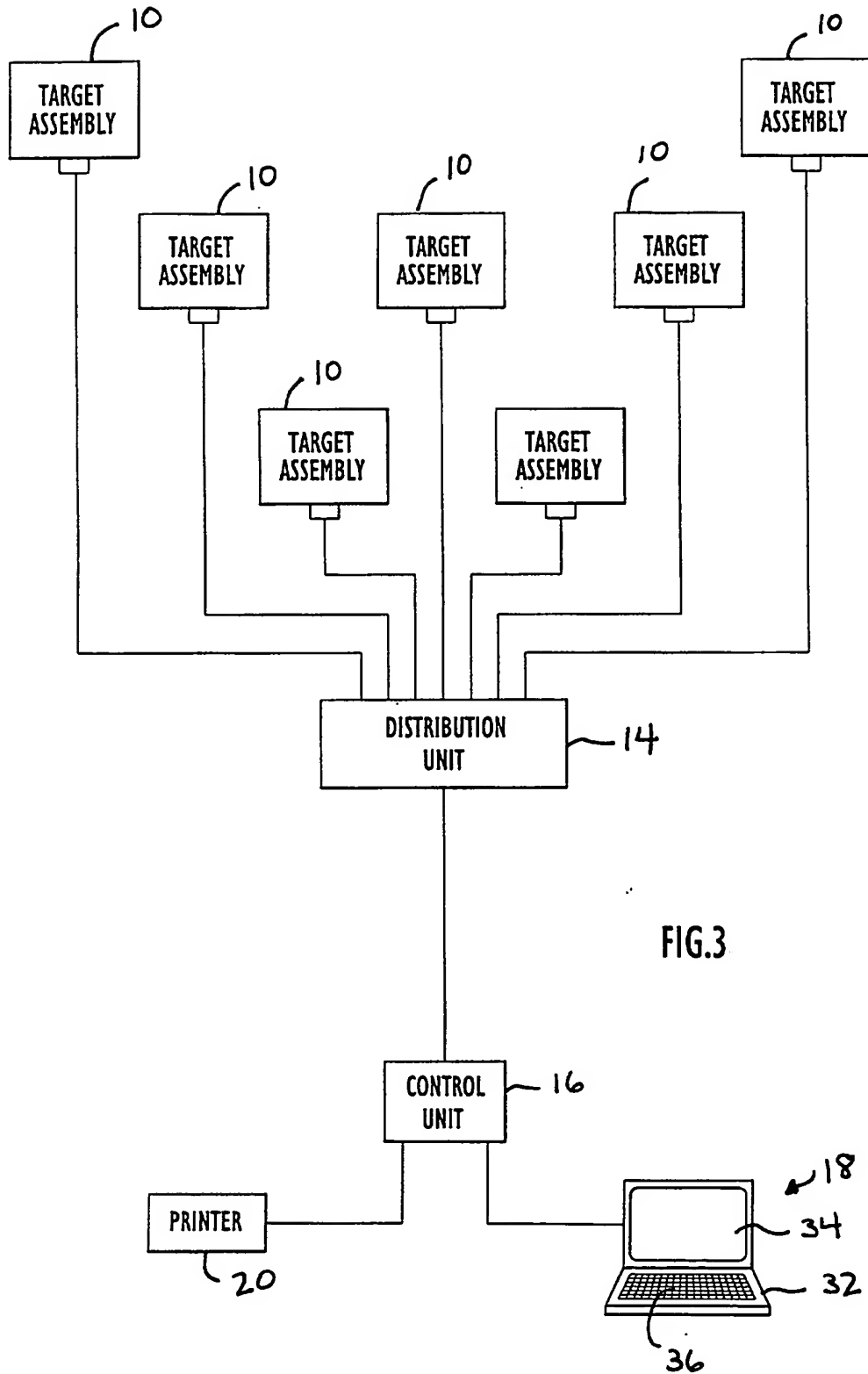
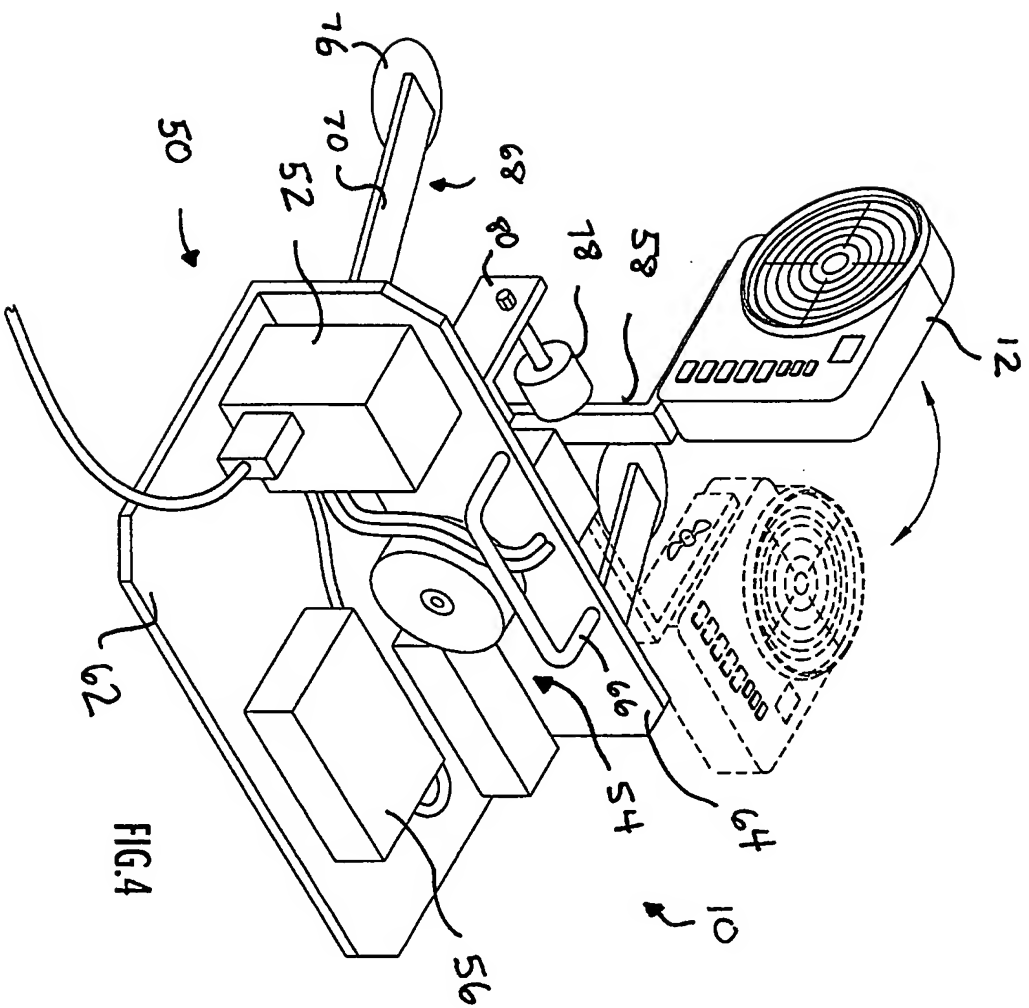


FIG. 2

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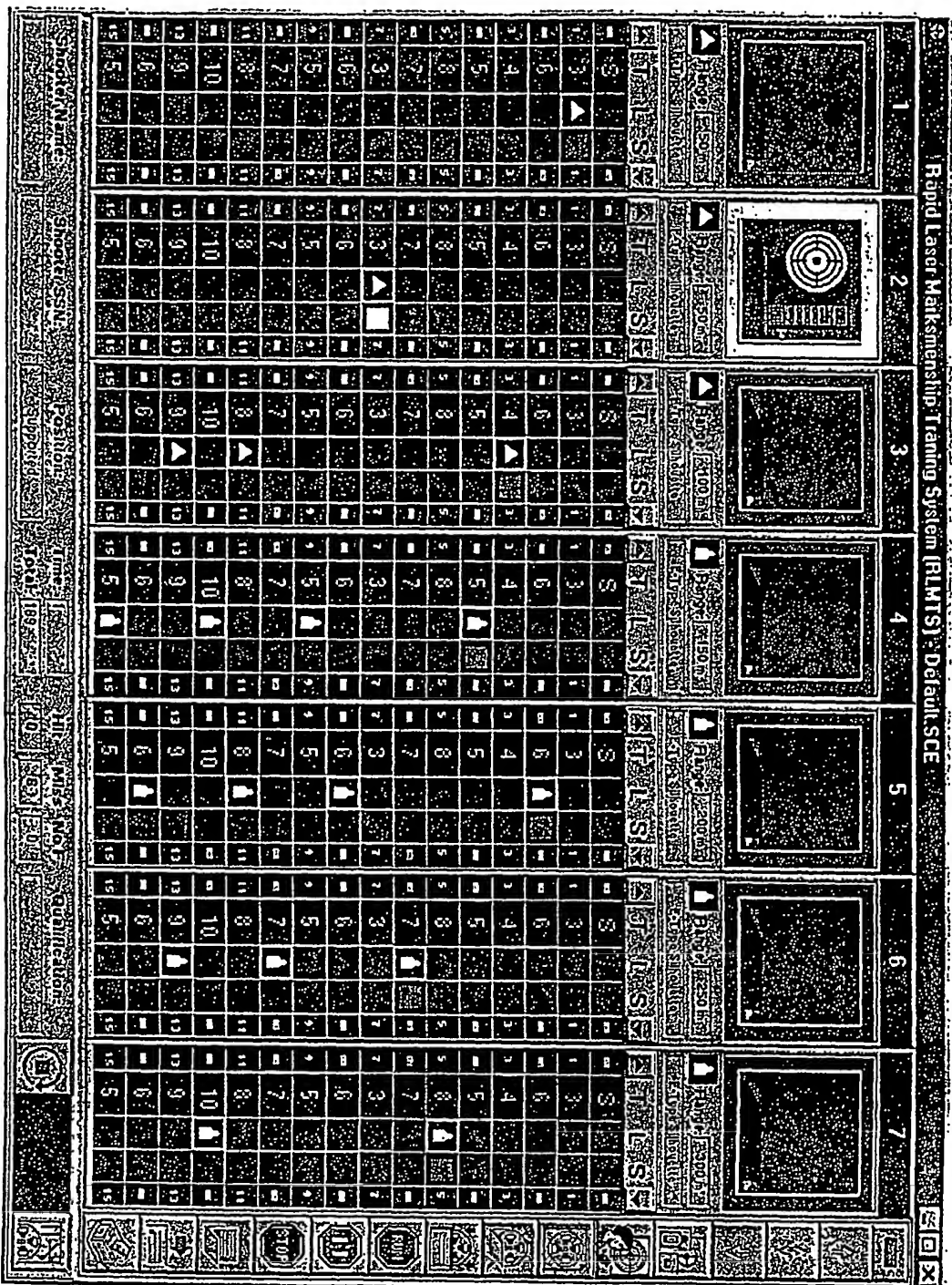
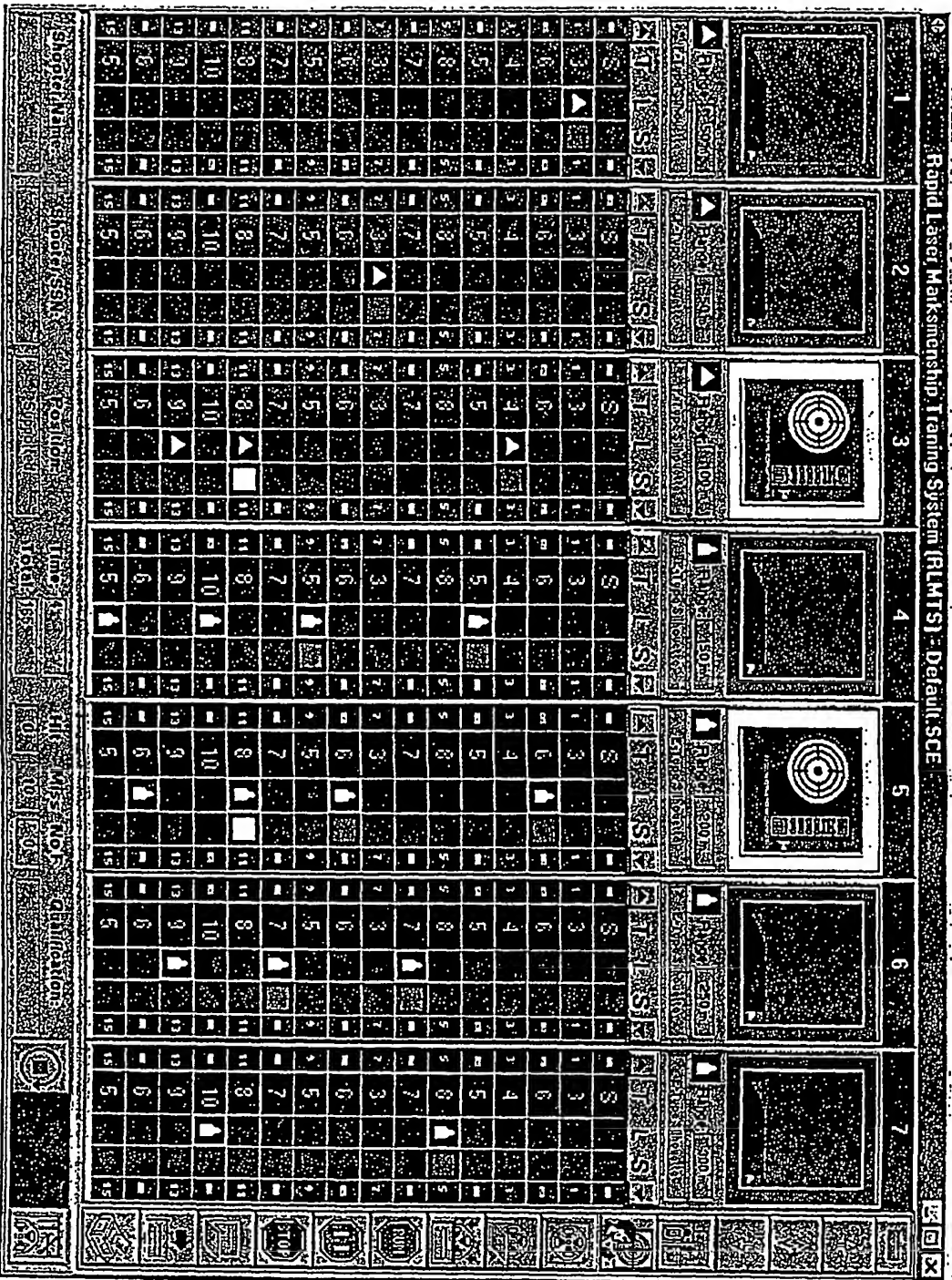


Fig. 6

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60205011.051500

Fig. 7

RAPID LASER MARKSMANSHIP TRAINING SYSTEM

RECORD FIRE SCORE REPORT

Date :

SHOOTER

Name (L,F,M):

SSN:

Grade :

Unit :

Roster No :

INSTRUCTOR

Name (L,F,M):

SCENARIO & SCORE

Seq.	Time	1	2	3	4	5	6	7
1	3	☒						
2	6					☒		
3	4			☒				
4	5				☒			
5	8							☒
6	7						☒	
7	3		☒					
8	6					☒		
9	5				☒			
10	7						☒	
11	8			☒		☒		
12	10			☒	☒			☒
13	9			☒			☒	
14	6				☒			
15	5				☒			
16	6	☒		☒				
17	-2			☒				
18	5			☒				
19	8						☒	
20	6				☒			
21	8		☒			☒		
22	12			☒	☒	☒		
23	8	☒		☒	☒			
24	8			☒				
25	8				☒			
26	9							☒
27	10			☒		☒		
28	12			☒	☒		☒	
29	8			☒	☒			
30	9			☒		☒		

TARGETS

- | | | | |
|---|---|---------------------|---------------|
| 1 | ☒ | : F-Type Silhouette | Range: 50 m. |
| 2 | ☒ | : F-Type Silhouette | Range: 50 m. |
| 3 | ☒ | : E-Type Silhouette | Range: 100 m. |
| 4 | ☒ | : E-Type Silhouette | Range: 150 m. |
| 6 | ☒ | : E-Type Silhouette | Range: 200 m. |
| 6 | ☒ | : E-Type Silhouette | Range: 250 m. |
| 7 | ☒ | : E-Type Silhouette | Range: 300 m. |

QUALIFICATION SETTINGS

EXPERT	: From 36	To 40
SHARPSHOOTER	: From 30	To 35
MARKSMAN	: From 23	To 29
UNQUALIFIED	: From 0	To 22

STARTING POSITION

SUPPORTED

LEGEND

- | | | |
|------------------------------------|----------|-------------|
| ☒ : Position Change to Unsupported | ☒ : Hit | ☒ : No Fire |
| ☒ : Position Change to Supported | ☒ : Miss | ☒ : Down |

INSTRUCTOR REMARKS

Supported Hits : 0	Unsupported Hits : 0	Total Hits : 0
Supported Misses : 0	Unsupported Misses : 0	Total Misses : 0
Supported No Fire: 0	Unsupported No Fire:	Total No Fire: 0

QUALIFICATION

EXPERT

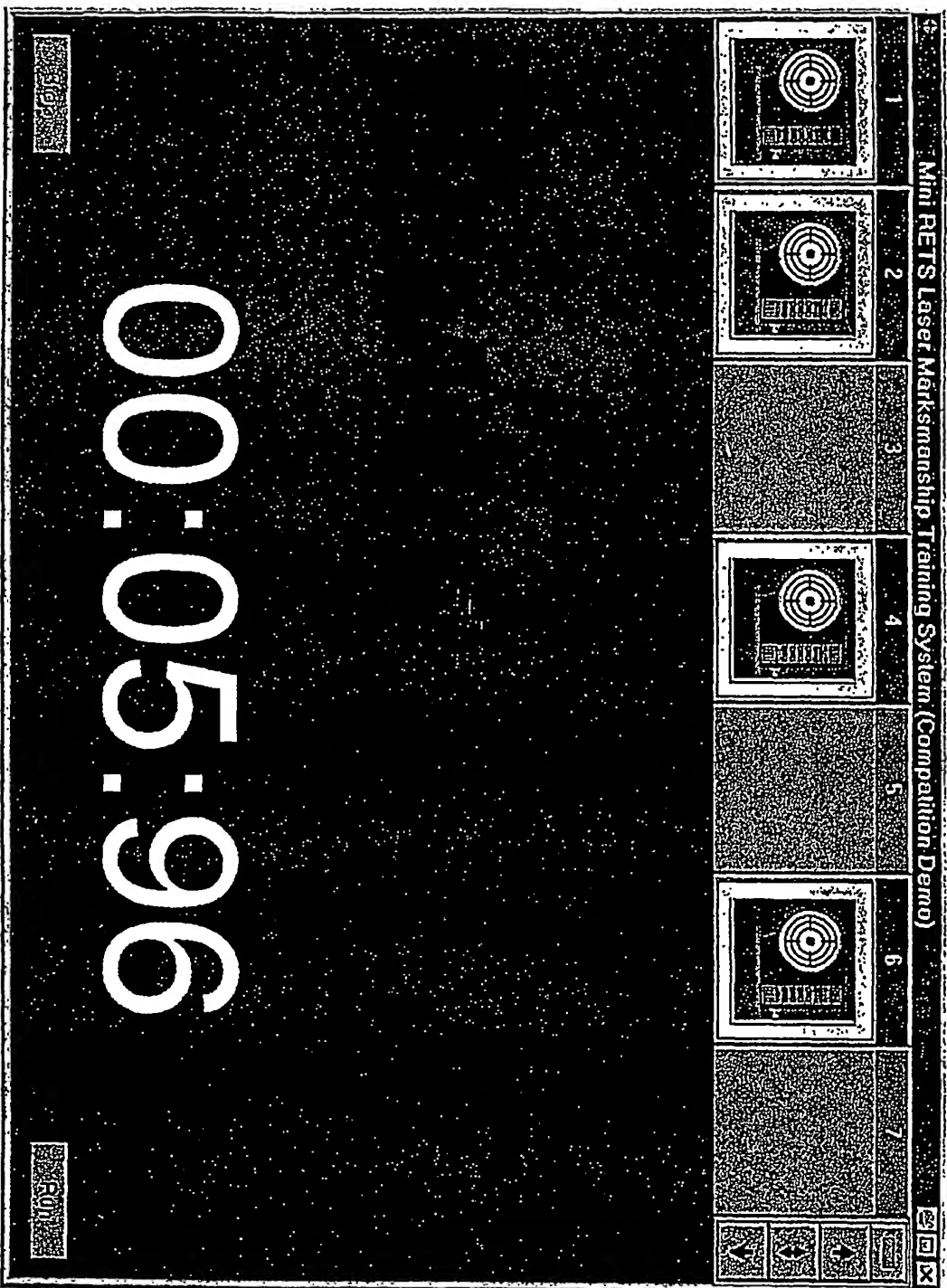


Fig. 9

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APPENDIX A

00203011.051500

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- [illegible]

[illegible]

- [illegible]

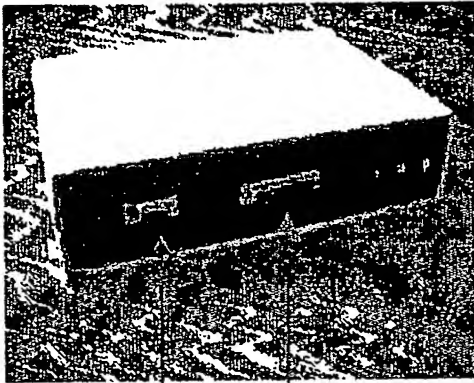
[illegible][illegible][illegible]

- [illegible]

[illegible]

- $\frac{d}{dt} \left(\frac{\partial L}{\partial v^j} \right) = \frac{\partial L}{\partial x^j}$

CCIU Visual Specifications:

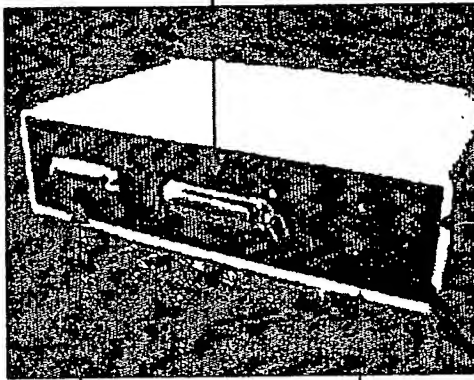


Communication
Indicators
(They are useful for
diagnostic purposes)

To Next CCIU

To CDB (Lifter Control I/O)

From Computer



Power LED

Power Cable

To Printer

Power ON/OFF (Printer/Lifter Selection)

Inside View



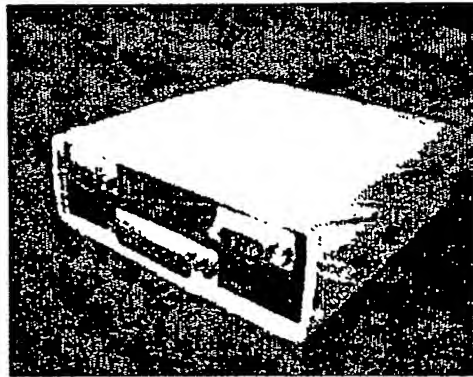
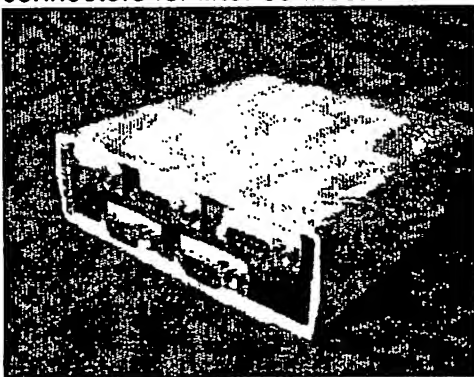
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CCIU Technical Specification:

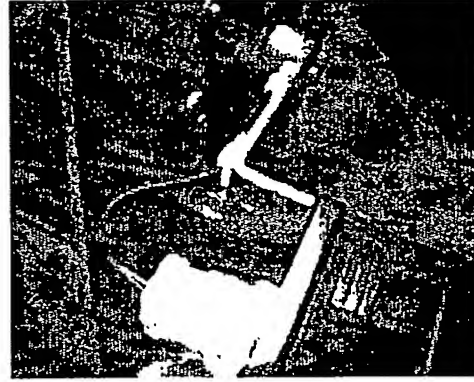
- . Standard Parallel Port Connection
- . Ground isolation between computer and CCIU with optocouplers.
- . Ground isolation between Lifter I/O port and CCIU interface with the usage of optocouplers for inputs and outputs.
- . Ground isolation between printer and CCIU
- . CCIU has a printer port. It works like a printer select box. With the power switch it transfers the computer parallel port to printer.
- . Power LED. It is designed for two purposes. It shows if the power is ON and it displays if the lifter port power is functional. CCIU real power functionality can be seen from communication indicator LED's. Lifter port power and ground completely separated from CCIU itself for safety purposes. None of the faulty units can easily cause malfunction on other unit because of the ground isolations in the system.
- . Communication indicators have different meaning in the system. They are useful for the diagnostics of the system. It will be explained later.
- . Input Power (115V 250mA fused) direct connection
- . Power ON/OFF or Printer/Lifter selection switch
- . Lifter port: 7 outputs for lifter up/down drive, 7 outputs for session start or Target reset drive, 7 inputs for hit detection, 4 lifter ground reference connection. Ground isolation with the CCIU. Reset outputs 500mA open collector. Hit detection inputs 12V/30mA (minimum 5V/5mA for sense) optocoupled inputs. Lifter Up/Down outputs 50ma with optocoupled outputs.
- . Minimum Conversion time between computer output and lifter I/O port is 800 μ sec.
- . Each lifter can be controlled separately.
- . Lifter I/O port LED's are placed in the CCIU Box for diagnostic purposes.
- . One Master CCIU can control 7 lifters by itself but 3 more slave units can be used to control 28 lifters. Slave CCIU is cost effective than master unit. It is using the same PCB with fewer components and does not have parallel port, printer port and power supply.

CDB Specification:

It is a distribution box. CCIU signals distributed to 7 DSUB (9-pin male) connectors for lifter connections.



Lifter and LCB Specs:

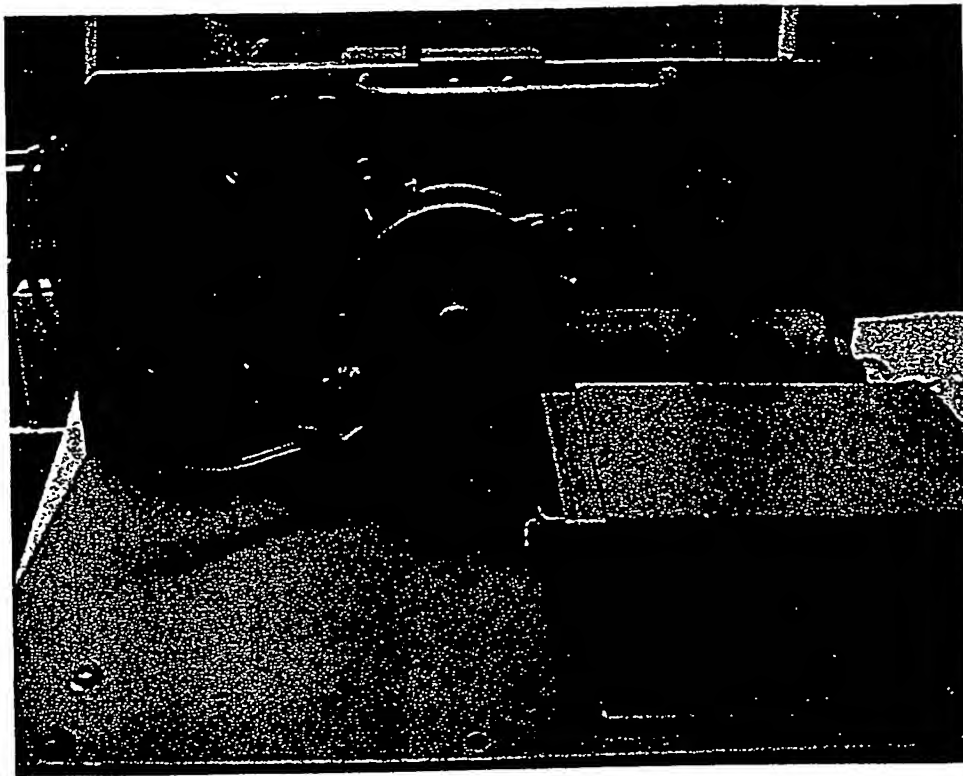


Front and back
views of the lifter

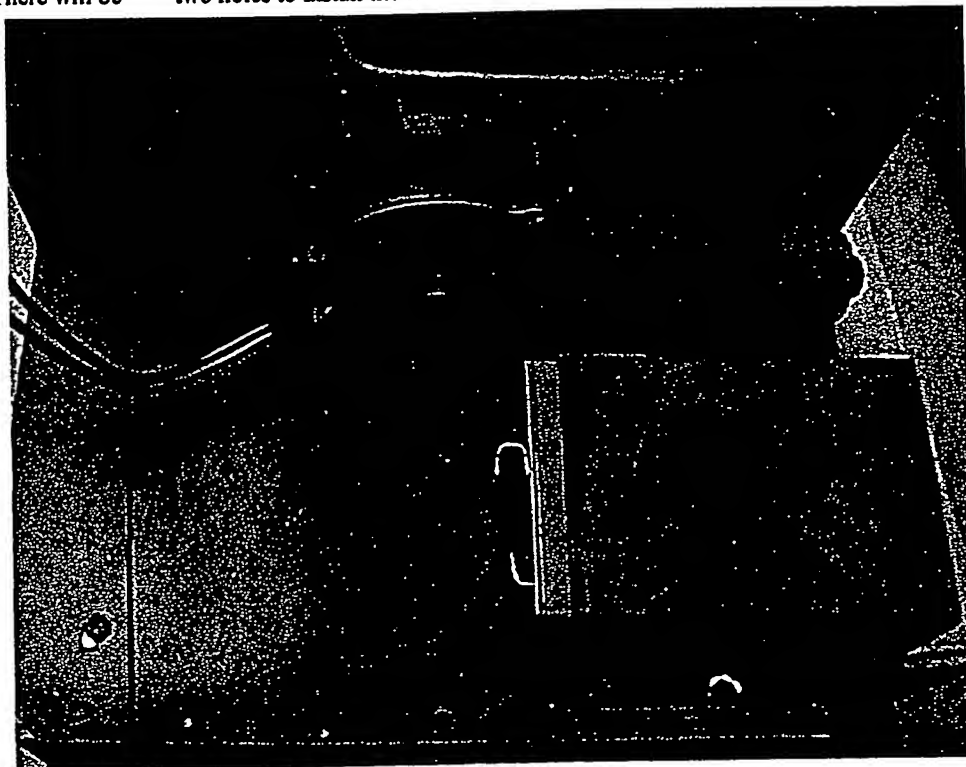


LCB Controlled by CCIU for UP/DOWN operations of the lifter but when the target gets hit it is automatically makes the target down. Indication LED's displays Lifter UP (Top Red), Hit Detect (Green Centre), Lifter Down. The Hit detect LED stays on until next lifter Down and Up operation. The LCB does not have a power on/off switch. It can be turn On/Off with the target ON/OFF switch. With the CCIU control it can reset the hit count information on the target display for session starts. It is fused for 5A at 6V motor power side. When it is in power off stage Lifter will stay down. The 6V dc power input is prototyped in a way that it can be driven with external power supply too. The power supply needs standard power jug to plug to the LCB. If you apply force to the lifter to make up or down it will burn the fuse at LCB. Because of this feature the motor output power has a power connector output. You can disconnect this output from motor and you can move the mechanism for transportation purposes. This is also useful for the test and design purposes. For the software generation and test designer can use this feature and can identify the operations with the usage of the LED's. The location of the LED's will change if it is useful for the shooter to see them. The time between hit to fall is less then 1μ sec.

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There will be two holes to install the lifter boxes.

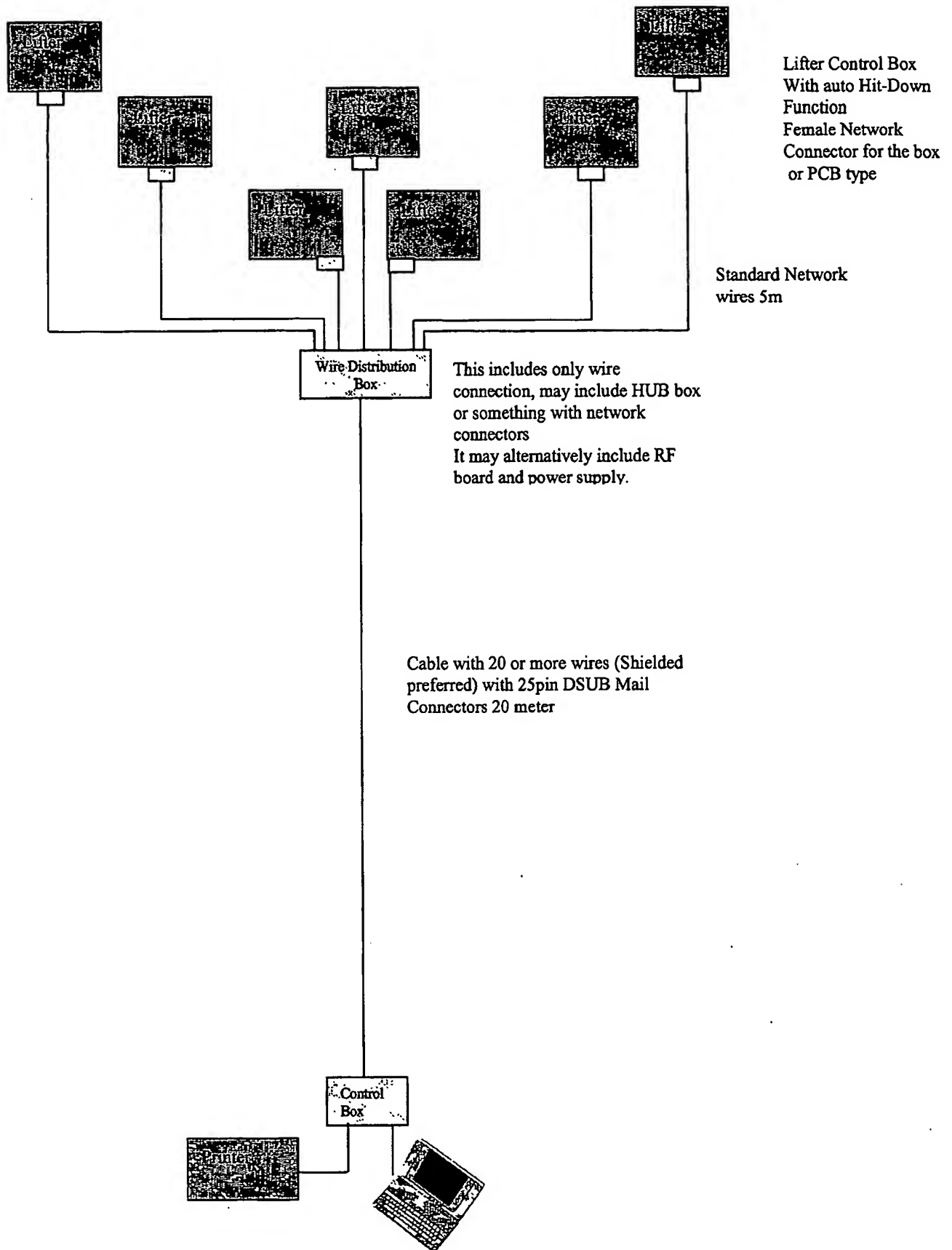


This screw must be flat top screw
The base of the box should lay on the surface of the lifter.

These cuts will be used to pass cables for switches and Target from one side to another and there will be no soldering for us.

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